इंटरनेट मानक

Disclosure to Promote the Right To Information

Whereas the Parliament of India has set out to provide a practical regime of right to information for citizens to secure access to information under the control of public authorities, in order to promote transparency and accountability in the working of every public authority, and whereas the attached publication of the Bureau of Indian Standards is of particular interest to the public, particularly disadvantaged communities and those engaged in the pursuit of education and knowledge, the attached public safety standard is made available to promote the timely dissemination of this information in an accurate manner to the public.

"जानने का अधिकार, जीने का अधिकार"
Mazdoor Kisan Shakti Sangathan
"The Right to Information, The Right to Live"

"पुराने को छोड नये के तरफ"
Jawaharlal Nehru
"Step Out From the Old to the New"

IS 4382 (1967): Non-tinted Ophthalmic Glass [MHD 5: Ophthalmic Instruments and Appliances]

"ज्ञान से एक नये भारत का निर्माण"
Satyanarayan Gangaram Pitroda
"Invent a New India Using Knowledge"

Act Number 22 of 2005
The Indian Parliament
RIGHT TO INFORMATION

Made Available By
Public.Resource.Org

"ज्ञान एक ऐसा खजाना है जो कभी चुराया नहीं जा सकता है"
Bhartṛhari—Nītiśatakam
"Knowledge is such a treasure which cannot be stolen"

BLANK PAGE

BRUTUM FULMEN

IGNORANTIA JURIS NON EXCUSAT

PROTECTED BY COPYRIGHT

IS : 4382 - 1967

(Reaffirmed 2002)

Indian Standard

SPECIFICATION FOR NON-TINTED OPHTHALMIC GLASS

(First Reprint MAY 1979)

UDC 681.43:[666.21]

© *Copyright* 1968

INDIAN STANDARDS INSTITUTION
MANAK BHAVAN, 9 BAHADUR SHAH ZAFAR MARG
NEW DELHI 110002

Gr 3

Price Rs 5·00

February 1968

Indian Standard
SPECIFICATION FOR NON-TINTED OPHTHALMIC GLASS

Optical and Mathematical Instruments Sectional Committee, EDC 36

Chairman	*Representing*
Dr C. S. Rao	The Andhra Scientific Co Ltd, Masulipatam
Members	
Shri P. V. Subba Rao (*Alternate* to Dr C. S. Rao)	
Shri R. R. Chakraborty	The National Instruments Limited, Jadavpur
Shri J. Sanyal (*Alternate*)	
Chief Hydrographer (Navy)	Indian Navy
Staff Officer (Hydro) (*Alternate*)	
Deputy Director Standards (Track)	Research, Designs & Standards Organisation (Ministry of Railways)
Assistant Director Standards (Track) (*Alternate*)	
Director, Instruments Research & Development Establishment	Ministry of Defence (R & D)
Shri S. S. Dharmayya (*Alternate*)	
Maj S. Ganguli	Ministry of Defence (DGI)
Maj P. S. Brahmacharee (*Alternate*)	
Shri S. K. Gautam	Quality Marked Goods Manufacturers' Co-operative Association Ltd, Roorkee
Shri Jai Prakash (*Alternate*)	
Shri A. Ghosh	National Test House, Calcutta
Shri D. D. Khosla	Directorate of Industries, Government of Haryana, Chandigarh
Col K. L. Khosla	Survey of India, Dehra Dun
Shri V. Krishnamoorthy	Directorate General of Technical Development, New Delhi
Shri D. Majumdar	Office of the Development Commissioner, Small Scales Industries, Ministry of Industrial Development & Company Affairs
Shri G. B. Jakhetia (*Alternate*)	
Shri B. R. Mankhand	The Koh-i-Noor (India) Private Limited, Varanasi

(*Continued on page* 2)

INDIAN STANDARDS INSTITUTION
MANAK BHAVAN, 9 BAHADUR SHAH ZAFAR MARG
NEW DELHI 110002

(*Continued from page* 1)

Members	*Representing*
Dr J. Prasad	Central Scientific Instruments Organisation (CSIR), Chandigarh
Shri B. L. Sharma (*Alternate*)	
Shri Prem Prakash	National Physical Laboratory (CSIR), New Delhi
Shri P. C. Jain (*Alternate*)	
Shri E. B. Rajderkar	Raj-Der-Kar & Co, Bombay
Shri Subhas Rajderkar (*Alternate*)	
Dr I. Ramakrishna Rao	In personal capacity (*16-3-5 Official Colony, Visakhapatnam 2*)
Shri M. M. Rao	Madras Institute of Technology, Madras
Representative	Directorate General, Ordnance Factories (Ministry of Defence)
Surveyor of Works II under Superintending Surveyor of Works I	Central Public Works Department
Shri H. C. Verma	Associated Instrument Manufacturers (India) Private Limited, New Delhi
Shri J. A. Unvala (*Alternate*)	
Shri M. V. Patankar, Director (Mech Engg)	Director General, ISI (*Ex-officio Member*)

Secretary

Shri S. M. Razvi
Deputy Director (Mech Engg), ISI

Optical Instruments Subcommittee, EDC 36 : 2

Convener	
Shri A. N. Bhattacharyya	Ministry of Defence (R & D)
Members	
Shri C. L. Batra	Towa Optics (India) Pvt Ltd, Delhi
Shri B. M. S. Chopra	Department of Industries, Government of Punjab, Chandigarh
Shri R. C. Jain	Ministry of Defence (DGI)
Shri S. N. Das Gupta (*Alternate*)	
Shri V. Krishnamoorthy	Directorate General of Technical Development, New Delhi
Shri S. K. Maheswari	Government Precision Instruments Factory, Lucknow
Shri P. C. Midha	Small Industries Service Institute, New Delhi
Shri D. R. Goyal (*Alternate*)	
Shri S. K. Mukherjee	Instrument Research Laboratory Ltd, Calcutta
Dr J. Prasad	Central Scientific Instruments Organisation (CSIR), Chandigarh
Shri J. L. Mathur (*Alternate*)	
Shri Ram Prashad	National Physical Laboratory (CSIR), New Delhi
Shri S. V. Gupta (*Alternate*)	
Representative	Directorate General, Ordnance Factories (Ministry of Defence)
Shri D. C. Roy	The National Instruments Limited, Jadavpur
Shri P. V. Subba Rao	The Andhra Scientific Co Ltd, Masulipatam

Indian Standard
SPECIFICATION FOR NON-TINTED OPHTHALMIC GLASS

0. FOREWORD

0.1 This Indian Standard was adopted by the Indian Standards Institution on 24 November 1967, after the draft finalized by the Optical and Mathematical Instruments Sectional Committee had been approved by the Mechanical Engineering Division Council.

0.2 This standard deals with the requirements of colourless or non-tinted ophthalmic glass for making spectacle lenses.

0.3 A separate standard dealing with the requirements of spectacle lenses is also under preparation.

0.4 For the purpose of deciding whether a particular requirement of this standard is complied with, the final value, observed or calculated, expressing the result of a test, shall be rounded off in accordance with IS : 2-1960*. The number of significant places retained in the rounded off value should be the same as that of the specified value in this standard.

1. SCOPE

1.1 This standard specifies the requirements of non-tinted ophthalmic glass used for making spectacle lenses.

2. TERMINOLOGY

2.0 For the purpose of this standard, the definitions given in IS : 1399-1959† and the following definitions shall apply.

2.1 Abbe Number (V) — A constant for a given sample of glass and also referred to as 'reciprocal dispersion' or constringence of glass. Abbe number (V) is given by the expression:

$$V = \frac{n_d - 1}{n_F - n_C}$$

where n_d is the refractive index of the glass for the d line of helium and n_F and n_C are those for the F and C lines of hydrogen.

---

*Rules for rounding off numerical values (*revised*).

†Glossary of terms used in optical technology.

2.2 Bifocal Lens — A lens having two distinguishable portions of different focal power, usually for different distance and near vision.

2.3 Blown Blank — Ophthalmic glass obtained by cutting from blown glass spheres.

2.4 Felps — Cracks extending through the material in a moulded blank.

2.5 Fused Bifocals — A blank in which a segment is fused into a depression in the main lens. The glass of the segment has a different refractive index from that of the main lens. The segment side of the combined lens forms one continuous surface when finished.

2.6 Fused Multifocal Lens — A lens in which different small segments are fused into depressions in the main lens. The glasses of the segments and that of the main lens have different refractive indices. The segment side of the combined lens forms one continuous surface when finished.

2.7 High Single Spectacle Lens — A single vision lens of high power.

2.8 Mean Dispersion — The difference between the refractive indices of the material for the F and C lines of hydrogen.

2.9 Multifocal Lens — A lens having three or more distinguishable portions of different focal power, usually for different distance and near vision.

2.10 Partial Dispersion — The difference between the refractive indices of the material for any two sets of wavelengths of visible radiation.

2.11 Moulded Blanks — Ophthalmic glass, moulded or pressed to predetermined sizes and shapes, approximating to those of the finished components to reduce wastage of glass and to keep machining operations to the minimum.

2.12 Rolled Sheet — Ophthalmic glass obtained by sheet glass or by plate glass process.

2.13 Slabs — Ophthalmic glass obtained by cutting or forming the chunk glass into plates and slabs.

2.14 Spectral Lines — The nine spectral lines used to define the optical properties of each glass type in terms of refractive index and dispersion values are indicated in the following table, the wavelength figures being in Ångstrom units:

	POTASSIUM (MEAN OF DOUBLE LINE)	HYDROGEN	SODIUM (MEAN OF DOUBLE LINE)	HELIUM	MERCURY
Red	A^1 7682	C 6563			
Yellow			D 5893	d 5876	
Green					e 5461
Blue		F 4861 G^1 4340			g 4358
Violet					h 4047

2.15 Type Number — A reference number of six digits used to indicate the glass type. The first three digits are composed of the numerals following the decimal point in the mean value of the refractive index of the material for helium *d* line (n_d) and the second group of three indicating the Abbe number without the decimal point (*see* **7.1**).

3. TYPES

3.1 Ophthalmic glasses shall be of two types as follows:

a) *Type* C — A special hard non-tinted crown glass of the given refractive index commonly used for making large bulk of single lenses; and

b) *Type* F — Flint glasses of different refractive indexes used in making of fused bifocal lens, multifocal lenses and high single spectacle lenses.

4. GENERAL REQUIREMENTS

4.1 Ophthalmic glass shall be in reasonably the same condition throughout and shall be homogeneous in composition and optical properties.

4.2 Ophthalmic glass shall be free from all impurities and deposits of undissolved or crystallized materials when tested by the methods specified in **6.1**.

4.3 Ophthalmic glass shall be free from striae, veins, reams, bubbles and seeds as far as possible when tested by the methods specified in **6.1**.

4.4 Ophthalmic glass shall be free from strain which causes double refraction. The process of annealing during manufacture, which is responsible for the presence of strain, shall be performed in proper and correct way such that the strain is minimum and symmetrically distributed. This shall be tested by the method specified in **6.2**.

4.5 Ophthalmic glass shall be durable and the polished surfaces shall be capable of withstanding atmospheric attack. Samples from different batches of ophthalmic glass shall be tested for durability by the method specified in **6.3** or by the method specified in IS : 2303-1963*. In the latter case it shall satisfy the requirements specified for Type 3 glass.

4.6 Ophthalmic glass shall possess a high degree of transparency and shall transmit visible light without showing any colour. It shall have no cloudiness or milky appearance.

4.7 Refractive index and thermal expansion which are the most important properties of ophthalmic glass shall be rigidly controlled during manufacture.

4.8 When tested for the transmissivity of white light using a standard photometer, ophthalmic glass shall indicate absorption of not more than two percent of the incident light per centimetre of the light path.

4.9 The specific gravity of the colourless crown glasses shall be between 2·57 and 2·60 and that of flint between 3·66 and 4·33.

4.10 Spectacle crown glass shall be available as rolled sheets having thickness from 2 to 12 mm and also in the form of slabs, blocks, moulded blanks or blown blanks.

4.11 The refractive index for the *d* spectrum line of the colourless (white crown) glass, when measured with a standard refractometer, may vary between 1·520 to 1·523, but the refractive index for a particular batch shall be correct within ±0·001.

4.12 The Abbe number (*V*-value) of colourless glass may vary between 58·2 to 58·9, but the value for a particular batch shall be correct within ±0·5.

4.13 The value of the mean dispersion ($n_F - n_C$) for non-tinted crown glass shall be 0·008 88. The values of partial dispersions for the spectral intervals between the spectrum lines *d* and *C*, and *F* and *d* shall be furnished by the manufacturer. All these values (of mean and partial dispersions) shall be correct within ± 0·000 05.

---

*Method of grading glass for alkalinity.

4.14 The refractive index for the *d* spectrum line of flint may vary between 1·625 to 1·700 but the refractive index for a particular batch shall be correct within ± 0·001.

4.15 The Abbe number (*V*-value) of flint may vary between 35·7 to 30·3 but the value for a particular batch shall be correct within ± 0·5.

4.16 The mean dispersion ($n_F - n_C$) and the partial dispersions ($n_d - n_C$) and ($n_F - n_d$) for flint shall be furnished by the manufacturer. All these values shall be correct within ±0·000 05.

5. SPECIAL REQUIREMENTS

5.1 Moulded Blanks

5.1.1 Ophthalmic glass formed in moulded blanks shall, in addition to satisfying the general requirements specified in **4**, be free from felps and folds introduced during the moulding operation. The blanks shall be free from edge or surface cracks resulting from contact with the tool during moulding.

5.1.2 The type of ophthalmic glass used in moulding of blanks shall be clearly stated in the contract (*see also* **3.1** and **6.3.1**).

5.1.3 The dimensions of moulded blanks shall conform to the specifications of the contract or relevant drawings. When only the dimensions of the finished components are specified, sufficient additional material shall be provided to allow for subsequent grinding operations.

6. TESTS

6.1 Test for Presence of Impurities and Defects — Every sheet, block, slab and blank of ophthalmic glass shall be examined for the presence of striae, bubbles, seeds and stones by either of the tests described in Appendix A of IS : 1400-1960*.

6.2 Test for Strain — Ophthalmic glass shall be tested for strain by any suitable method or as given in **4.8.2** of IS : 1400-1960*.

6.3 Test for Durability — Samples from each batch of ophthalmic glass shall be tested for durability by the test given in **4.10.2** of IS : 1400-1960*.

7. MARKING

7.1 Each block or slab forming part of a lot, from the same melt and annealing, shall have the glass type (C for crown, F for flint), the type number and melt numbers marked in waterproof, abrasion resistant marking ink (*see* **2.15**).

---

*Specification for optical glass.

Example:

A crown glass (C) of refractive index 1·520 for helium *d* line (n_d) with an Abbe number 58·2 of melt 5725, shall have the following marking:

C 520/582 5725

7.2 Moulded blanks shall be marked in a similar manner as shown in **7.1**, except that the melt number shall be replaced by the purchaser's part number.

Example:

A flint glass (F) of refractive index 1·625 for helium *d* line (n_d) with an Abbe number 35·7 for part number 26 shall have the following marking:

F 625/357 26

7.2.1 Spherical surfaces shall be kept free of raised marking as far as practicable to permit use of gauges.

7.3 The blocks, slabs and blanks of ophthalmic glass may also be marked with the ISI Certification Mark.

NOTE — The use of the ISI Certification Mark is governed by the provisions of the Indian Standards Institution (Certification Marks) Act and the Rules and Regulations made thereunder. The ISI Mark on products covered by an Indian Standard conveys the assurance that they have been produced to comply with the requirements of that standard under a well-defined system of inspection, testing and quality control which is devised and supervised by ISI and operated by the producer. ISI marked products are also continuously checked by ISI for conformity to that standard as a further safeguard. Details of conditions under which a licence for the use of the ISI Certification Mark may be granted to manufacturers or processors, may be obtained from the Indian Standards Institution.

8. PACKING AND PACKAGING

8.1 Each type and size of blocks, slabs and blanks shall be packed separately by wrapping them in kraft paper with slip sheets of soft paper between them. The joints shall be secured with adhesive tape. The weight of each package shall not be more than 5 kg unless otherwise specified.

8.2 The material, type, size, quantity and the name of the manufacturer shall be clearly marked on each package.

8.3 Not more then ten such unit packages, securely cushioned separately with suitable material, shall be packed in a plywood or other suitable wooden box in accordance with normal commercial practice.

8.4 Information regarding the material, type, size quantity of ophthalmic glass and the name of the manufacturer shall be marked on the box. It shall also be marked with the standard symbol for indicating fragile contents and the symbol for 'THIS-WAY UP' according to IS : 1286-1967*, together with the legend 'GLASS, HANDLE WITH CARE' in red.

---

*Pictorial markings for handling of goods in general (*first revision*).

AMENDMENT NO. 1 OCTOBER 1979

TO

IS : 4382-1967 SPECIFICATION FOR NON-TINTED OPHTHALMIC GLASS

Alterations

(*Page* 6, *clause* **4.4**) — Substitute the following for the existing clause:

'**4.4** Ophthalmic glass shall be free from strain which causes double refraction. The process of annealing during manufacture, which is responsible for the presence of strain, shall be such that the strain is not more than 20 nm per centimetre of light path. The strain shall be symmetrically distributed. The strain shall be determined by the methods described in **6.2.**'

(*Page* 6, *clause* **4.8**) — Substitute the following for the existing clause:

'**4.8** When tested for the transmissivity of white light using a standard photometer, ophthalmic glass shall indicate absorption of not more than two percent (for crown glass) and three percent (for flint glass) of the incident light per centimetre of the light path.'

(*Page* 6, *clause* **4.9**) — Delete the clause and renumber the subsequent clauses accordingly.

[*Page* 6, *clause* **4.12** (*renumbered as* **4.11**), *line* 2] — Substitute ' 58 to 59 ' *for* ' 58·2 to 58·9 '.

[*Page* 6, *clause* **4.13** (*renumbered as* **4.12**)] — Delete this clause and renumber the subsequent clauses accordingly:

[*Page* 7, *clause* **4.15** (*renumbered as* **4.13**), *lines* 1 *and* 2] — Substitute ' 36 to 30 ' *for* ' 35·7 to 30·3 '.

[*Page* 7, *clause* **4.16** (*renumbered as* **4.14**)] — Delete.

(*Page* 7, *clause* **6.2**) — Substitute the following for the existing clause:

'**6.2 Test for Strain** — Ophthalmic glass blanks shall be tested for strain by the methods described in **6.2.1** and **6.2.2**. While Method A (*see* **6.2.1**) is suitable for samples with heavy strain (over 100 nm), Method B is to

Price Rs **1·50**

be used where the total strain in the specimen is less than 100 nm. Method B is, therefore, the one to be generally employed particularly in the case of samples of optical glass, provision of testing facilities for Method A will also be desirable in order to do a preliminary screening by the use of Babinet Compensator, that is, to determine the order of magnitude of the strain and to determine which of the two extinction positions is the correct one.

6.2.1 *Method A* — The optical bench arrangement for this test shall be as shown in Fig. 1.

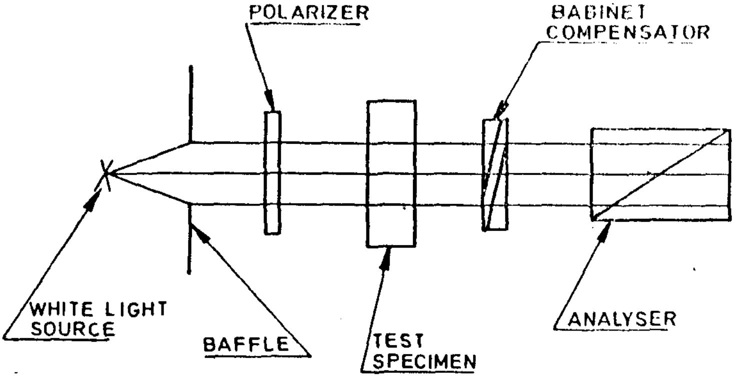

Fig. 1

Initially the polarizer and analyser are set in the crossed position and the compensator is set 45° to the polarizer when several coloured and one dark band is seen in the field. The compensator micrometer screw is moved till the dark band is under the reference line etched on the first prism. This shall be taken as micrometer reading R_1. The distai between the initial position with the dark band under the etched reference line and next colour band is measured (*reading* R_2) on the micrometer screw. For more accurate meaurement white light may be replaced by monochromatic light or a suitable colour filter may also be used.

The sample is introduced as shown in the diagram. The maximum displacement of the dark band is noted, rotating the sample when white light is used. If the displacement of the dark band is less than a quarter of the space between the dark band and the next coloured band, the set up given for Method B (*see* **6.2.2**) shall be used for measurement of strain. If the displacement of the dark band is nearly a quarter or more, Babinet Compensator itself shall be used for the measurement of strain. (Sometimes the displacement may be several bands).

The total strain of the sample in nanometres is equal to the displacement of the micrometer from the initial position to, when the sample is introduced and rotated till the maximum displacement is observed, divided by the displacement for one fringe, multiplied by the wave length of the light used in nanometres.

For example if R_1 is the initial reading when the black fringe is under the etched line, R_2 the reading when the line is moved to the next fringe, R_3 the reading with the sample rotated to give maximum displacement and micrometer moved till the line is once again under the black line, then the strain is $\frac{R_3 - R_1}{R_2 - R_1} \times \lambda$. Strain for unit length is obtained by dividing the total strain by the length of the passage of the beam through the specimen.

If the strain is such that the displacement of the black fringe cannot be measured conveniently on the micrometer screw of the compensator, Method B given in **6.2.2** shall be used.

6.2.2 *Method B* — In the test set up shown in Fig. 2, the polarizer and analyser are set in crossed position.

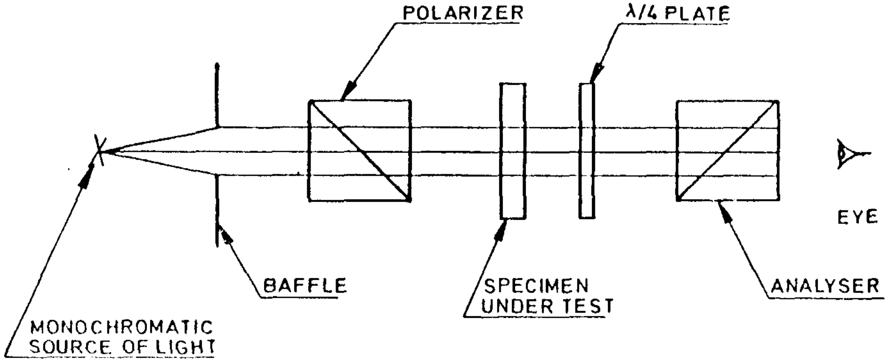

Fig. 2

With the quarter wave plate introduced and rotated till the light is extinguished, the specimen under test is introduced and rotated perpendicular to the optical axis of the system till the light is again extinguished. The specimen is rotated accurately 45° from the position of the extinction when maximum light is seen in the field. The analyser is rotated till the light is again extinguished. The rotation θ of the analyser is noted. The total strain in the specimen is given as $\theta \times \lambda/180$ where θ is the rotation of the analyser and λ is the wavelength of the light expressed in nanometres. For sodium light the strain for a rotation of angle θ expressed in degrees is 3·27 × θ nm. The strain per unit length is obtained by dividing the total strain by the length of the path of the ray through the specimen. The following factors shall be borne in mind for this test:

a) The quarter-wave plate shall be used with manochromatic light for which it is intended,

b) The specimen stage and the analyser shall be provided with a facility of rotation to an accuracy of at least one degree,

c) The extinction angle as obtained by this method will be θ or (180 — θ) but the initial examination by the Babinet Compensator will reveal the correct angle, and

d) The percentage transmission in the crossed position between the polarizer and the analyser should not be more than 0·5 percent.'

(EDC 36)

Printed at New India Printing Press, Khurja, India